

MIGRATION RECORDS IN AUSTRALIA. 4. PIERIDAE (LEPIDOPTERA) OTHER THAN *ANAPHAEIS JAVA TEUTONIA* (F.)

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Abstract

Information on migration in 12 of the 32 species of Pieridae occurring in Australia is summarised.

Introduction

This paper presents a summary of information available on migration of Australian Pieridae, other than *Anaphaeis java teutonia* (F.) for which there are many records and which will be dealt with more appropriately in a separate paper. Of the 32 species of this family in Australia 12 are here recorded as confirmed or likely regular migrants (*A. java* being a thirteenth); for some of the species there are very few records. Further observations are needed on all of them, especially those which have their main centre of distribution in Queensland and which occasionally extend their range southward by migratory flights.

Appias paulina ega (Boisd.)

Lucas (1887) records the "appearance" of this species at Balaclava, Victoria. Williams (1929) mentions a south-easterly migration at Westwood, Queensland, and (Williams 1930a) refers to a comment from Waterhouse that small flights occur in early autumn. Waterhouse (1932) mentions it as common in some areas near Sydney when it is migratory, and Barrett and Burns (1951) mention local flights resulting from breeding in enormous numbers in some seasons. Crosby (1963) records the species from Malacoota, Victoria. Rose (1972) records it from Ku-ring-gai National Park, N.S.W., in 1971. Table 1 gives recent unpublished records for this species.

The few records available suggest that the species occasionally extends its range by migration to the south, even as far as Victoria; this may occur frequently but only be noticed in periods of high population levels, mainly during December to February. Extension seems to have occurred on a noticeable scale in the summers of 1963, 1964, 1969 and 1971. Sankowsky (pers. comm.) noted at Goodnight Scrub (near Wallaville, SE Qld), that large numbers were in flight in December 1969 but were no longer present there three weeks later. This suggests possible emigration, perhaps similar to that on which Barrett and Burns (1951) based their comment mentioned above.

Catopsilia pomona pomona (F.)

Barnard (1883), Waterhouse (1932), Williams (1930a) and Barrett and Burns (1951) refer to the migratory habit of this species in general terms but despite this, and even though the species has the common name of "lemon migrant", there are remarkably few detailed records for such a

conspicuous and obviously migrant species. Hudson (1898) records a specimen from New Zealand. Williams (1929) mentions a south-easterly movement on 9th January 1924 at Westwood, Qld and Waterhouse (1932) a similar movement in January 1928 at Rockhampton, Qld. Moulds (1963, 1964) and Peters (1963) have listed specimens seen in the Sydney and Broken Bay (N.S.W.) areas during January, February and March in 1962 and 1963; where flight directions were recorded they were nearly all southerly or easterly. Fletcher (1953) reported an invasion of Heron Island by this species. More recent unpublished records are included in Table 2.

This species appears to behave in much the same way as *Appias paulina ega*; it probably has regular population movements within its northern breeding range with southerly extensions of the movements at certain times of year, mainly in December to February but occasionally earlier and later. Also, the years in which *A. P. ega* appears to have made extensive southern invasions coincide mainly with the major southerly extensions of this species.

The observations of J. N. Yates at Caloundra, Qld, are the most detailed available. Southerly movements were noted from 22nd February to 9th March 1981, the insects flying at heights between 2-7 metres from 11.00 hrs to 17.00 hrs. Numbers were greatest around midday but flights ceased during overcast and rainy periods. Movement appeared to be in narrow "streams", a feature often seen in population movements of *Anaphaëis java teutonia*.

The greatest numbers were observed on 4th March when the following numbers were counted over a 30 m front:

Time (eastern standard)	No. of specimens
12.55-13.00	209
13.00-13.05	201
13.05-13.10	204
13.10-13.15	172
13.15-13.20	199
13.20-13.25	185
13.25-13.30	203
Total 35 mins	1373

Between 4th and 9th March the migration continued but in reduced numbers. Despite the magnitude of the southerly movement at Caloundra there were no reports of the migrations continuing as far south as New South Wales.

Catopsilia pyranthe crokera (W. S. Macleay)

Williams (1929) records this species as occurring in Melbourne in April and Waterhouse (1932) and Common and Waterhouse (1972, 1981) mention immense flights in Queensland at irregular intervals, with a general direction from north to south and that they reach Sydney but rarely Melbourne. Waterhouse and Lyell (1914) record a southerly movement in Sydney in February 1895 and Williams (1930a) records a flight of about 100/hr passing through a garden in Killara, N.S.W., from 5th March to about 10th April,

TABLE 1
Records of migration of *Appias paulina ega*

Locality	Date	Direction	Observer
Kariong, N.S.W.	10.ii.1964	SSW	M. Burnell
Thornleigh, N.S.W.	6-30.xi.1964	SSW/NE	M. R. Long
Turramurra, N.S.W.	21.xii.1969	S	C. N. Smithers
Childers-Maryborough, Q.	xii.1969	NW	G. Sankowsky
Bellingen River, near Thora, N.S.W.	i.1971	E	M. S. Moulds
Lorn, Maitland, N.S.W.	i-ii.1971	occasional specimens	A. D'Ombrain
Ryde, N.S.W.	1.ii.1971	S (few specimens)	J. V. Peters
Yallourn, V.	25.ii.1971	1 specimen	H. Crane
Wahroonga, N.S.W.	28.ii.1971	1 specimen	A. B. Rose

TABLE 2
Records of migration of *Catopsilia pomona pomona*

Locality	Date	Direction	Observer
Seven Hills, N.S.W.	21.i.1962	—	J. V. Peters
Toowoomba, Q.	23-24.xi.1964	E	M. Russell
Mackay-Rockhampton, Q.	8.i.1970	N 20-30/min	W. Frost
Menangle Park, N.S.W.	15.xi.1970	appearance	E. O. Edwards
Colo River, N.S.W.	16.xii.1970	appearance	J. V. Peters
Bayview, N.S.W.	10-17.xii.1970	N	L. C. Haines
Ku-ring-gai Chase and Pymble, N.S.W.	16.xii.1970	SW	J. V. Peters and M. S. Moulds
Wahroonga, N.S.W.	19.xii.1970	appearance	A. B. Rose
Maitland, N.S.W.	i-ii.1971	appearance	A. D'Ombrain
Turramurra, N.S.W.	15.ii.1971	appearance	C. N. Smithers
Ku-ring-gai Chase, N.S.W.	9-20.viii.1971	appearance	A. B. Rose
Wahroonga, N.S.W.	xi.1972	appearance	A. B. Rose
Caloundra, Q.	22.ii-9.iii.1981	S (see text) 5/min/30 m.	J. N. Yates

1928. This species is such a well known migrant that it is referred to as the "common migrant" but, like *C. pomona*, details of the migrations are very few. Recent unpublished records are presented in Table 3.

The data so far available suggests that *C. pyranthe* has a migration pattern similar to that described above for *C. pomona* and *A. paulina*; large scale movements occurred in early 1971, at which time these species were also very actively moving. In that year flights of *C. pyranthe* started with a few specimens in late February and early March. Numbers were greatest on 19th

March after which fewer were seen, with the main flight virtually ending at about the end of March although a few specimens were seen at Gloucester as late as 21st April.

Cepora perimale scyllara (W. S. Macleay)

Common and Waterhouse (1972, 1981) mention one specimen from Nowra, N.S.W., and one from near Melbourne of this otherwise common northern species. It occasionally appears in Sydney but is seldom seen south of Newcastle. If this species is a migrant within its range it certainly does not make the regular extensions to the south which are seen in the *Catopsilia* spp.

Delias aganippe (Don.)

There is only one observation of massed flight in this species, a very spectacular NNW movement at Long Reef Golf Course, Sydney, N.S.W., on 2.xii.1969 (obs. J. V. Peters, M. S. Moulds, C. N. Smithers). On 20th May 1970 three specimens were seen on Erskine Island, Capricorn Group, Qld but neither before nor afterwards. The conclusion reached was that the specimens must have come from adjacent coastal areas (Reeves 1971). This species is known to congregate in numbers, as at Nar Nar Goon, Victoria, in December 1970 (obs. K. Reid) but whether such aggregation is associated with population movement is not known.

Delias harpalyce (Don.)

Williams (1929) reports annual westerly movement of this species in Victoria. One specimen has been seen about 12 km from Gabo Island, off the coast of Victoria (obs. A. S. Angus). Aggregations have been reported from Nar Nar Goon, Victoria, in December 1970 and March 1971 (obs. K. Reid) (see also comment under *Delias aganippe* above).

Delias nigrina (F.)

Olliff (1889) mentions that this species is a migrant but does not give details. Waterhouse (1932) states categorically that it is not a migrant.

There are, however, recent detailed observations which suggest that it does undertake northerly flights, mainly in April/May; perhaps these are short distance flights. These observations are listed in Table 4.

Eurema brigitta australis (Wallace)

Peters (1969) gives two records of this species from notes by G. A. Waterhouse in the Australian Museum (15th April 1934 at Killara, N.S.W. and 14th April, 1950 at Clifton, N.S.W.) and a third from his own observations at Lindfield, 11th February 1962. These occurrences, all in Sydney, suggest possible infrequent summer or autumn movement into the area, the usual southern end of its range is further north at about the Richmond R, south of which Common & Waterhouse (1981) mention the species as being sporadic.

Eurema hecabe phoebus (Butler)

Dodd (1955) records a northerly flight of tens of thousands over the sea near Bowen, Qld. Williams (1929) mentions flights with *E. smilax* and Rose

TABLE 3
Records of migration of *Catopsilia pyranthe crokera*

Locality	Date	Direction	Observer
Botany, N.S.W.	ii.1962	SW (hundreds seen)	R. Mascord
Lindfield, N.S.W.	20.ii-3.iii.1963	several seen	J. V. Peters
Ku-ring-gai Chase N.S.W.	12-31.iii.1971	S 25/30min/100m (on 19.iii.1971)	A. B. Rose
Ryde, N.S.W.	20.iii.1971	small numbers	J. V. Peters
Wagga Wagga, N.S.W.	22.iii.1971	appearance	P. Bungay
Camden, N.S.W.	25.iii.1971	S, SW, SSW	C. N. Smithers, M. S. Moulds G.A. Holloway
Gloucester, N.S.W.	21.iv.1971	appearance	A. B. Rose
Ryde, N.S.W.	10.iii.1973	appearance	J. V. Peters
48 km N Singleton, N.S.W.	5.iv.1981	S one specimen	C. N. Smithers

TABLE 4
Records of migration of *Delias nigrina*

Locality	Date	Direction	Observer
Kempsey and Hatt Head, N.S.W.	16-20.v.1967	NW 120/min flying out to sea	B. Brown
Sawtell, N.S.W.	20.iv.1964	N 35/min/50m	P. J. Wilson
Sawtell, N.S.W.	27.iv.1968	N 1/min/50m	P. J. Wilson
Sawtell, N.S.W.	3.v.1968	2/min/50m	P. J. Wilson
Hastings Point, N.S.W.	28.viii.1969	N few specimens	H. J. de S. Disney
Scott Head to Nambucca, N.S.W.	25-26.iv.1976	N small nos.	P. J. Wilson

(1972) mentions its occurrence in Ku-ring-gai Chase, Sydney, N.S.W., in February 1971. Fletcher (1973) reported an invasion of Heron Island, Qld, on 4th and 5th January 1971. On April 8th and 10th 1971 a SE movement involving many specimens was noted at Coorabell, near Byron Bay, N.S.W. (obs. C. Trickett). On 20th-22nd April 1971 a northerly movement was reported at Alstonville, N.S.W. The species had been common for several weeks before but did not appear to migrate until the 20th (obs. W. Wright).

It is interesting to note that Coorabell and Alstonville are about 20 km apart and that the flight directions recorded are almost opposite to one another. This suggests that a southerly movement was followed immediately by a northerly one; possibly the same specimens were involved.

Although not recording specific migration, comments by Rainbow (1907), Waterhouse (1932), Barrett and Burns (1951) and Moulds (1964) suggest southerly movement in autumn.

Eurema smilax (Don.)

Williams (1930a, 1930b, 1937), Upton (1949), Poulton (1933) and Barrett and Burns (1951) make general references to the migratory habits of this species. Anderson and Spry (1893) refer to it swarming.

Waterhouse and Lyell (1914) record a westerly migration in October 1894 at Gisbourne, Victoria, and Williams (1929) refers to a southerly migration at Woodford, N.S.W., from 21st April to 4th May 1906 in which specimens were passing at 50/hr. The flights were often accompanied by specimens of *E. hecabe* and *E. herla* (W. S. Macleay). Alexander (1917) reports on a "flight" in south-western Australia in the summer of 1914-15. Fenselau (1977) reported the species moving south at Sealake, Victoria, at the end of August 1977, a year in which many reports of southerly migration were received (see Table 5). Unpublished records accumulated since 1962 are presented in Table 5.

This species is clearly a regular migrant. Numbers are usually small, with individuals being widely separated; such small population movements are easily missed unless a special watch is kept. Movement is likely to take place at any time from December to April and the major movements are to the south. If northerly movements of even smaller numbers do take place, they would be hard to detect. The only northerly record is that for Barraba, N.S.W., on 1st December 1969 (obs. M. Showers).

It is interesting to note that the movement of 1977 started very suddenly with enormous numbers appearing in the Hunter Valley on 27th March at which time they also appeared in numbers at Stanwell Tops near Sydney (obs. G. Daniels).

Eurema herla (W. S. Macleay)

The only record of population movement in this species is provided by Waterhouse and Lyell (1914) who mention specimens accompanying a southerly flight of *E. smilax* at Woodford, N.S.W., from 21st April to 4th May 1906 (see also under *E. smilax* above).

Pieris rapae rapae (L.)

The history of the spread of this Palearctic species has been summarised by Peters (1970). It is well known as a migrant in Europe but little is known of population movements in Australia, there being only one observation reported of a northerly movement on 12th October 1970 at Box Hill, Footscray and Brooklyn, Victoria, when a count of 80-160/hr was made (obs. A. Riddell).

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TABLE 5
Records of migration of *Eurema smilax*

Locality	Date	Direction	Observer
Seven Hills, N.S.W.	20.i.1962	S	J. V. Peters
Lindfield, N.S.W.	11.ii.1962	S	J. V. Peters
Lindfield, N.S.W.	19.i.1963	S	J. V. Peters
Lindfield, N.S.W.	iii.1963	S	J. V. Peters
Ryde, N.S.W.	6.i.1964	S	J. V. Peters
Ryde, N.S.W.	25.ii.1967	S	J. V. Peters
Ryde, N.S.W.	2.iii.1968	S	J. V. Peters
Razorback, N.S.W. (near Camden)	22.xi.1968	S	J. V. Peters
Camden, N.S.W.	25.x.1969	S	J. V. Peters
Barraba, N.S.W.	1.xii.1969	N	M. Showers
		great numbers	
Ryde, N.S.W.	20.xii.1969	S, SW	J. V. Peters
Ryde, N.S.W.	1.ii.1971	S	J. V. Peters
Castle Hill, N.S.W.	17.x.1971	S	J. V. Peters
Moss Vale, N.S.W.	24.x.1971	S	J. V. Peters
Mt. Wilson, N.S.W.	12.ii.1972	S	J. V. Peters
Ryde, N.S.W.	10.iii.1973	S	J. V. Peters
North Turramurra, N.S.W.	10.iii.1973	S	C. N. Smithers
Ryde, N.S.W.	19.iii.1973	S	J. V. Peters
20km N Singleton, N.S.W.	27.iii.1977	S	C. N. Smithers
		1/min/50m	
Stanwell Tops, N.S.W.	27.iii.1977	appearance in numbers	G. Daniels
Sydney, N.S.W.	29.iii.1977	S	G. Daniels
Sydney, N.S.W.	30.iii.1977	S	C. N. Smithers
Round Hill Reserve, N.S.W.	9.iv.1977	SW	G. Daniels
Condobolin to Cudal, N.S.W.	11.iv.1977	S	G. Daniels
48km N. Singleton, N.S.W.	12.iv.1977	S	C. N. Smithers
48km N. Singleton, N.S.W.	16.iv.1977	S	C. N. Smithers
Sydney, N.S.W.	17.iv.1977	S	G. Daniels
Sydney, N.S.W.	9.iii.1979	S	G. Daniels
Engadine, N.S.W.	10.iv.1979	1 specimen seen	G. Daniels

References

- Alexander, W. B., 1933. Australian Danae, Euploine and Pierine butterflies and Uraniid moths. In Poulton, E. B., The gregarious resting habits of danaine butterflies in Australia; also of heliconine and ithomiine butterflies in tropical America. *Proc. R. ent. Soc. Lond.* 7(3): 64-65.
- Anderson, E. and Spry, F. P., 1893 & 1894. *Victorian butterflies and how to collect them*. H. Hearne, Melbourne. 129 pp.
- Barnard, G. 1883. Scarcity of Lepidoptera in Queensland. *Entomologist* 16(No. 245): 238-239.
- Barrett, C. L. and Burns, A. N., 1951. *Butterflies of Australia and New Guinea*. N. H. Seward, Melbourne. Pp. i-x, 187 pp., 8 pls.
- Common, I. F. B. and Waterhouse, D. F., 1972. *Butterflies of Australia*. Angus and Robertson, Sydney. i-xii, 498 pp., 41 pls.
- Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies fo Australia*. Angus and Robertson, Sydney. i-xiv, 682 pp., 25 figs, 49 pls.
- Crosby, D. F., 1963. The butterflies of the Malacoota district. *Aust. Zool.* 13(1): 54-56.
- Dodd, A. P., 1955. No title. In Notes. *Minut. ent. Soc. Qd* 10th May, 1955: 3.
- Fenselau, I. C., 1977. A flight of the chequered swallowtail. *Victorian Ent.* 7(5): 62.
- Fletcher, B. S., 1973. Observations of a movement of insects at Heron Island, Queensland. *J. Aust. ent. Soc.* 12(2): 157-160, table 1, 1 fig.
- Hudson, G. V., 1898. *Moths and butterflies of New Zealand*. West, Newman and Co., London. i-xix, 144 pp.
- Lucas, T. P., 1887. Notes and queries. Visit of northern butterflies to Melbourne. *Vict. Nat.* 3(11): 152-153.
- Moulds, M. S., 1963. Records of northern butterflies in the Sydney district. *Commun. ent. Sect. R. zool. Soc. N.S.W.* 17: 36-38, 45-46.
- Moulds, M. S., 1964. Records of northern butterflies in the Sydney district. *Commun. ent. Sect. R. zool. Soc. N.S.W.* 23: 63-67.
- Olliff, A. S., 1889. *Australian butterflies: a brief account . . .* Nat. Hist. Soc. N.S.W., Sydney. 49 pp.
- Peters, J. V., 1963. Records of northern butterflies in the Sydney district 1962-63. *Commun. ent. Sect. R. zool. Soc. N.S.W.* 21: 53-54.
- Peters, J. V., 1969. Notes on the distribution of Australian Hesperidae and Papilionidae (Lepidoptera). *Aust. zool.* 15(2): 178-184.
- Peters, J. V., 1970. The cabbage white butterfly. *Aust. Nat. Hist.* 16(9): 300-303, illustr.
- Poulton, E. B., 1933. See Alexander, W. B. 1933.
- Rainbow, W. J., 1907. *A guide to the study of Australian butterflies*. T. C. Lothian, Melbourne. 272 pp., pls I-VI, 19 pls unnumbered.
- Reeves, D. M., 1971. Notes on some butterflies from Erskine Island, Capricorn Group. *Qd Nat.* 20(1-3): 54-55.
- Rose, A. B., 1972. Additional records of butterflies from Ku-ring-gai Chase National Park, New South Wales. *Aust. ent. Mag.* 1(2): 5-6.
- Upton, M. S., 1949. Insect migration in Australia. *Australasian Ent.* 1(1): 3-8.
- Waterhouse, G. A., 1932. *What butterfly is that?* Angus and Robertson, Sydney. i-x, 291 pp. pls I-XXXIV.
- Waterhouse, G. A. and Lyell, G., 1914. *The butterflies of Australia*. Angus and Robertson, Sydney. i-vi, 239 pp., 43 pls, map.
- Williams, C. B., 1929. Evidence for the migration of butterflies. *Bull. Soc. R. ent. Egypt* (n.s.) 1929(4): 193-210.
- Williams, C. B., 1930a. *The migration of butterflies*. Oliver and Boyd, London. i-xi, 473 pp.
- Williams, C. B., 1930b. Collected records relating to insect migration. Second series. *Trans. ent. Soc. Lond.* 78: 139-170.
- Williams, C. B., 1937. *Butterfly migration in the tropics*. British Museum, London. 10 pp., 5 pls.